



Consumer/Home/Recreation

Heat Pipes

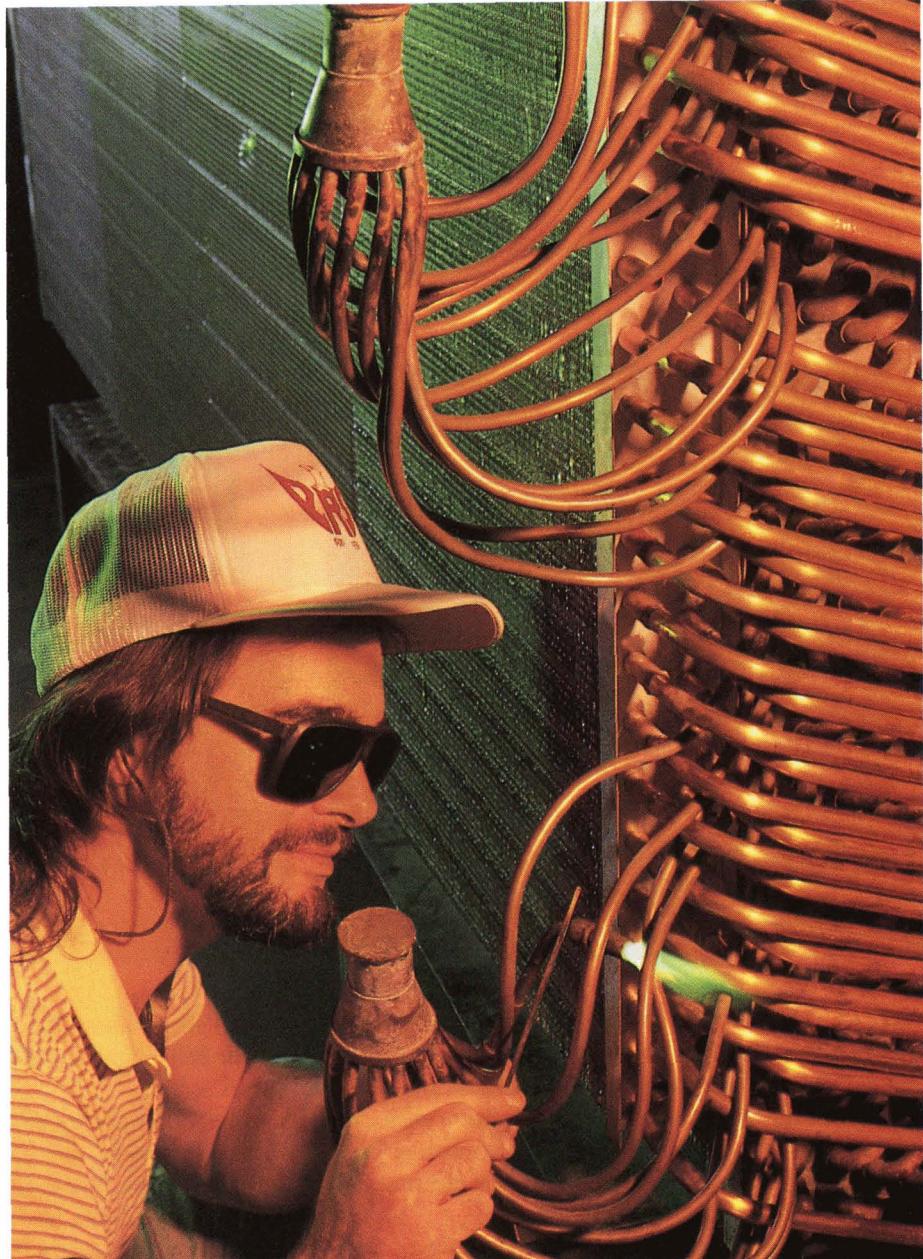
NASA -
developed
heat pipes
control
supermarket
humidity
and provide
bonus
energy
savings



Shown below is a Phoenix 2000 rooftop refrigeration/air conditioning system for supermarkets, manufactured by Phoenix Refrigeration Systems, Inc. (PRS), Conyers, Georgia. **At right**, a PRS craftsman is applying the finishing touches to a heat pipe unit; heat pipes are an optional feature of the Phoenix 2000 designed to control humidity in the supermarket and afford energy savings in the process.

An application of NASA space technology, the heat pipe addition to the Phoenix 2000 stemmed from PRS participation in an ongoing large scale field test of heat pipes as enhancements of air conditioning systems. The objective is to evaluate the heat pipe as a high efficiency alternative for humidity control in supermarkets, which require greater dehumidification capacity than most commercial facilities, therefore can realize the most significant savings in energy consumption and improved frozen product marketability due to lower frost formation.

Georgia Power Company is spearheading the demonstration/performance verification program; other participants, in addition to PRS, include Alabama Power Company, Florida Power Corporation,



Mississippi Power Company and Wisconsin Electric Power Company, along with a number of supermarket chains. The sponsors will share results with supermarkets, equipment designers and manufacturers.

The top center photo shows one of frequent meetings held by participants; second from left is project manager Dennis L. Keebaugh of Georgia Power. **At top right**, Keebaugh is conferring with Professor James M. Akridge, Georgia Institute of Technology, who conducted a study of heat pipe applications for Georgia Power and who serves as a consulting member of the team.

Originally developed by NASA for temperature control of sensitive space electronic systems, the heat pipe is a simple but highly effective heat transfer system. The individual heat pipe is a sealed tube containing a small amount of liquid refrigerant. In a multitube heat pipe system, each tube is inclined so that the refrigerant can flow to the lower



end by gravity.

The low end is an evaporator, the high end a condenser. When the refrigerant flows to the low end, it evaporates and absorbs heat in the process. The low density vapor then rises to the other end, where it releases heat and condenses into a liquid to repeat the cycle. This provides a system that alternately cools and heats without significant use of energy or any moving parts.

Its potential is described in this report from Georgia Power:

"Typical air conditioning systems often lack the moisture removal capacity to cope with high-moisture cooling loads. ...Heat pipes provide a simple, low cost alternative to complex and expensive desiccant systems and mechanical dehumidification systems. Heat pipes are ideal in situations where low humidity must be maintained, where moisture gains are unusually high, or for drying materials or products. They have already been used successfully in libraries, candy storage facilities and now, supermarkets. Heat pipes have also proven effective for moisture control in indoor spa and pool buildings and in residences in humid climates."

Georgia Power kicked off the program in July 1989 with an installation at a Winn Dixie supermarket in Lithonia, Georgia. PRS supplied a standard rooftop refrigeration/air conditioning system modified to include a 144-tube heat pipe system. The heat pipes' job is to ease the load on the air conditioner and provide more effective humidity control at reduced energy expenditure. Normally, the air conditioner alone could lower humidity, but to do so its cooling coil would have to operate longer and use more energy. Then, in the process of lowering humidity, it would overcool the air, necessitating



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reheating the air to a comfortable temperature with more energy expenditure. The heat pipes precool the air before it reaches the cooling coil. After the coil removes the remaining heat and humidity, the heat pipes reheat the overcooled air to the proper temperature. Thus the heat pipes dehumidify more efficiently and provide significant energy savings.

Since the first installation, the project has expanded to include supermarkets in Wisconsin, Florida, Virginia, Texas, New York and Maryland. An interim report on the findings at the Winn Dixie supermarket indicated that the system performed well and did in fact effect consumption reductions, but more data was required to fully quantify the energy savings and the impact of the heat pipes on the air conditioning system.